

In the claims:

1 1. In a radio communication system having a sending station that sends data to a
2 receiving station, the data formatted at an upper-level logical layer and into an upper-level data
3 frame, and the upper-level data frame provided to a lower-level logical sublayer, the upper-
4 level data frame further formatted thereat into at least one lower-level frame, the lower-level
5 logical layer operable pursuant to an H-ARQ feedback scheme, an improvement of apparatus
6 for facilitating retransmission by the sending station of the upper-level data frame if the
7 receiving station fails adequately to receive the at least one lower-level frame, said apparatus
8 comprising:

9 an H-ARQ detector embodied at the lower-level logical sublayer, said H-ARQ
10 detector for detecting H-ARQ indications returned by the receiving station to the sending
11 station; and

12 an H-ARQ status response generator embodied at the lower-level logical
13 sublayer of the sending station and adapted to receive indications of detections made by said H-
14 ARQ detector, said H-ARQ status response generator for generating an H-ARQ status response
15 message for delivery to the upper-level logical layer to notify the upper-level logical layer of
16 the sending station when said H-ARQ detector detects an H-ARQ indication indicating that the
17 receiving station fails adequately to receive the at least one lower-level frame, the upper-level
18 logical layer selectably operable responsive to receipt of the H-ARQ status response responsive
19 to receipt of the H-ARQ status response message to provide again the upper-level data frame to
20 the lower-level logical sublayer.

1 2. In the radio communication system of claim 1, wherein the receiving station
2 comprises a retransmission timer, the retransmission timer for timing a first time period
3 commencing with detecting reception at the receiving station of the at least one lower-level
4 frame, wherein the sending station selectably initially sends the at least one lower-level frame
5 in segmented portions at a second, reduced data rate, an improvement of apparatus for the
6 receiving station for facilitating reception of the at least one lower-level frame in the segmented
7 portions, said apparatus comprising:

8 a retransmission timer resetter adapted to receive indications of detection of
9 reception of the segmented portions of retransmission of the lower-level frame at the second,
10 reduced data rate, said retransmission timer resetter for causing resetting of the retransmission
11 timer when the lower-level frame is retransmitted in the segmented portions.

1 3. The apparatus of claim 2 wherein said receiving station further comprises a
2 resequencing buffer, said resequencing buffer for buffering the segmented portions of the
3 lower-level frame when delivered to the receiving station.

1 4. The apparatus of claim 3 wherein the receiving station further comprises a
2 resequencing buffer timer, said resequencing buffer timer for timing a second time period
3 commencing with detection of reception of a segmented portion of the lower-level frame when
4 retransmitted.

1 5. The apparatus of claim 4 wherein the second time period timed by said
2 resequencing buffer timer is of a time substantially corresponding to the first time period timed
3 by the retransmission timer.

1 6. The apparatus of claim 4 wherein each segment of the segmented portions has
2 associated therewith a segment identifier and wherein the receiving station further comprises a
3 missing-segment detector for identifying which, if any, segmented portions failed to have been
4 delivered and buffered at the resequencing buffer when the resequencing buffer times out.

1 7. The apparatus of claim 6 wherein the receiving station further comprises a
2 retransmission request generator adapted to receive indications of timing out of the
3 resequencing buffer, said retransmission request generator for generating an NAK
4 retransmission request responsive to timing out of the resequencing buffer and detection of at
5 least one missing segment by said missing segment detector.

1 8. The apparatus of claim 7 wherein the NAK retransmission request comprises
2 missing frame indications detectable by said retransmission timer.

1 9. The apparatus of claim 1 wherein the lower-level logical sublayer comprises a
2 MAC (Medium Access Control) layer and wherein said H-ARQ detector and said H-ARQ
3 status response layer are embodied at the MAC layer.

1 10. The apparatus of claim 1 wherein the upper-level logical layer comprises an
2 RLP (Radio Link Protocol) layer and wherein the H-ARQ status response message is delivered
3 by said H-ARQ status response generator to the RLP layer.

1 11. The apparatus of claim 1 wherein the H-ARQ status response message is further
2 generated to indicate that the receiving station successfully received the at least one lower-level
3 frame.

1 12. The apparatus of claim 1 wherein the H-ARQ status response message further
2 identifies with which upper-level data frame that the H-ARQ indications received by said H-
3 ARQ detector are associated

1 13. The apparatus of claim 12 wherein the upper-level data frame formed by the
2 upper-level logical layer comprises a frame sequence number and wherein the H-ARQ status
3 response message includes an indication of the frame sequence number.

1 14. The apparatus of claim 13 wherein the upper level data frame comprises an RLP
2 (Radio Link Protocol) frame and wherein the frame sequence number comprises an RLP
3 sequence number.

1 15. In a method of communicating in a radio communication system having a
2 sending station that sends data to a receiving station, the data formatted at an upper-level
3 logical layer and into an upper-level data frame, and the upper-level data frame provided to a
4 lower-level logical sublayer, the upper-level data frame further formatted thereat into at least

5 one lower-level frame, the lower-level logical layer operable pursuant to an H-ARQ feedback
6 scheme, an improvement of a method for facilitating retransmission by the sending station of
7 the upper-level data frame if the receiving station fails adequately to receive the at least one
8 lower-level frame, said method comprising:

9 detecting, at the lower-level logical sublayer, H-ARQ indications returned by the
10 receiving station to the sending station;

11 generating an H-ARQ status response message for delivery to the upper-level
12 logical layer to notify the upper-level logical layer of detection during said operation of
13 detecting an H-ARQ indication indicating that the receiving station fails adequately to receive
14 the at least one lower-level frame; and

15 delivering the H-ARQ status response message to the upper-level logical layer.

1 16. The method of claim 15 further comprising the operation, responsive to delivery
2 of the H-ARQ status response message during said operation of delivering, of providing again
3 the upper-level data frame to the lower-level logical sublayer.

1 17. In a method of communicating in a radio communication system having a
2 sending station that sends data to a receiving station, the data formatted at an upper-level
3 logical layer and into an upper-level data frame, and the upper-level data frame provided to a
4 lower-level logical sublayer, the upper-level data frame further formatted thereat into one
5 lower-level frame, the lower-level logical layer operable pursuant to an H-ARQ feedback
6 scheme, the receiving station comprises a first retransmission timer, the first retransmission

7 timer for timing a first time period commencing when a missing upper-level frame is detected
8 at the receiving station, wherein the sending station selectably initially sends at least one
9 upper-level frame at a first data rate and retransmits, if necessary, segmented portions of the at
10 least one upper-level frame at a second, reduced data rate, an improvement of a method for
11 facilitating reception of the segmented portions of the at least one upper-level frame, said
12 method comprising:
13 detecting reception at the receiving station of retransmission of the upper-level
14 data frame at the second, reduced data rate; and
15 resetting the first retransmission timer when the at least one upper-level frame is
16 retransmitted in the segmented portions.

1 18. The method of claim 17 further comprising the operations of:
2 buffering the segmented portions of the at least one upper-level frame when
3 delivered to the receiving station; and
4 timing a separate time period commencing for each segmented portion of the at
5 least one upper-level frame when the segmented portion is detected missing during the
6 retransmission.